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NOTULAE BOTANICAE HORTI AGROBOTANICI, 1982, XII.

GENETIC RESOURCES IN THE CULTIVATED FLORA OF THE APUSENI MOUNTAINS

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Abstract:
SZABÓ T.A., 1982, Genetic resources in the cultivated flora of the Apuseni Mountains. Not.bot.hort.agrobot.Cluj., XII,15-28
In order to detect genetic resources formed during specific relations between plant life, and human activity in a sample territory situated in the North-Eastern border of the Apuseni Mountains (Transylvania, Romania) 416 cultivated plant species were identified, and reliable ethnobotanical material was collected. The influence of different geographical regions of the world on the flora of the territory was characterized by an influence index. The influence index "I" of the American, African and Australian species on the spontaneous flora of the sample territory was very low, (I_1 = 2,o1), but on the cultivated flora it was very high (I_2 = 58,48), reflecting the strong impact of foreign floras and agricultures. The cultivated flora of the territory was characterized according to following descriptors: geographical origin, life form, main traditional usage, main place of cultivation, frequency of cultivation, degree of domestication, ethnobotanical knowledge related to different species, local variability, territorial dynamics (related to genetic erosion or sedimentation), and territorial distribution.

Key words: cultivated flora, ethnobotany

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One of the main research tasks outlined recently in economic and applied botany is to analyze mutual relationships between plant

species and human life, according to the following criteria: 1. spontaneous flora and vegetation as ecological conditions of human life; 2. human life as ecological factor influencing species dispersal and vegetation dynamics; 3. plant cultivation as a prerequisit to agro-ecosystem development; 4. vernacular knowledge stored in cultural traditions of different communities, related with these mutual influences.

Material and method

In order to characterize plant-and-man relationships by reliable newly collected data, a sample territory was chosen in 1971 on the North-Eastern border of the Apuseni Mountains (Transylvania, Romania), lined out according to the NYÁRÁDY - VICOL chorological mapping system (fig.1 and fig.2), covering about 750 km^2 and 55 settlements with about 55 000 inhabitants. This sample territory was studied between 1972-1981 by means of floristical, geobotanical and ethnobotanical methods, in collaboration with dr.J.PÉNTEK, a specialist in ethnology and dialectology. The spontaneous flora and vegetation was studied according to the methodology generally accepted in Middle Europe for similar studies. Data regarding the cultivated flora and ethnobotanical knowledge was systematically registered in every locality using standard questionaries. Sample specimens of plants and seeds were collected and preserved in the seed collection and scientific herbarium of the "Dr.Petru Groza" Agronomy Institute.

The statistical analysis of the cultivated flora was performed using the descriptors and descriptor states presented in table 1.

Tab.1.

Descriptors and descriptor states used for the analysis and characterisation of the cultivated flora of the sample territory

Descriptors

o1 Geographical origin ("Old World")

Descriptor states

o1.o1 Carpathian, Balkanian and Endemic species; o1.o2 Mediterranean and Souther European species; o1.o3 European, Atlantic, Alpin, Pyrrenean; o1.o4 Pontic, Continental; o1.o5 Eurasitaic, Circumpolar; o1.o6 Asiatic, Siberian (in broader sense); o1.o7 Central - and Western Asiatic; o1.o8 Eastern Asiatic; o1.o9 Southern Asiatic; o1.1o Cosmopolitan.

o2 Geographical origin ("New World")

o2.o1 North American; o2.o2 Central American; o2.o3 South-American; o2.o4 North-African; o2.o5 Central African; o2.o6 South-African; o2.o7 Australian; o2.o8 Oceanian; o2.o9 undefined; o2.1o other situations (e.g.hybrids).

o3 Life form

o3.o1 Th; o3.o2 TH; o3.o3 H; o3.o4 HH; o3.o5 G; o3.o6 Ch; o3.o7 M,N; o3.o8 MM; o3.o9 Ep; o3.1o other situations.

o4 Main traditional usage

o4.o1 staple food (carbohydrates); o4.o2 staple food (fats, proteins); o4.o3 legumes; o4.o4 spices, addictives; o4.o5 fruits; o4.o6 row materials, fodders; o4.o7 ornamentals; o4.o8 tea and spice ; o4.o9 medicinal; o4.1o other situations (e.g. once cultivated,at present weedy etc.).

o5 Main place of cultivation

o5.o1 pots; o5.o2 garden and pot; o5.o3 flower garden; o5.o4 legume and fruit graden; o5.o5 crop field; o5.o6 road side; o5.o7 churchyard, park lawn; o5.o8 lawn, pasture; o5.o9
o5.1o other situations (e.g. forest tree).

o6 Frequency of cultivation

o6.o1 very sparsely; o6.o2 sparsely; o6.o3 often; o6.o4 very often; o6.o5 commonly; o6.o8 uncertain, unknown; o6.o9 no more cultivated; o6.1o other situations.

o7 Period of domestication (approximated)

o7.o1 very ancient; o7.o2 ancient; o7.o3 Middle Ages; o7.o4 XVI-XIX century; o7.o5 XXth century; o7.o7 very recently domesticated; o7.o8 uncertain; o7.1o other situations.

o8 Degree of domestication

o8.o1 fully domesticated (in cultivation only); o8.o3 strongly domesticated; o8.o5 moderately domesticated; o8.o7 scarcely domesticated (semiwild); o8.o9 not domesticated (wild); o8.1o other situation (e.g. uncertain).

o9 Local variability

o9.o1 very little; o9.o3 little; o9.o5 medium size; o9.o7 large; o9.o9 very large; o9.1o uncertain and other situations.

1o Ethnobotanical knowledge in relation to the species

1o.o1 insignificant (known, without name); 1o.o3 superficial (just named);1o.o5 medium size (name and usage); 1o.o7 good (name and many uses); 1o.o9 very good (more uses); 1o.1o other situations.

11. Territorial dynamics

11.o1 stabilized; 11.o2 of recent advent; 11.o3 slow by spreading (week genetic sedimentation); 11.o4 spreading and strongly variabile (genetic sedimentation); 11.o5 slowly withdrawing (week genetic erosion); 11.o6 disappearing (strong genetic erosion);11.o7 disappeared (genetic erosion finished);11.1o uncertain and other situations.

12. Territorial distribution (distributed chiefly in):

lo.ol Căpuş Valley; 12.o2 Căpuş and Nadăş Valley; 12.o3 Nadăş Valley; 12.o4 Nadăş-Căpuş-Criş Valley; 12.o5 Criş Valley; 12.o6 Almaş and Criş Valley; 12.o7 Almaş and Nadăş Valley; 12.o8 Călata Valley; 12.o9 Dîngău Highland; 12.lo generally distributed (and other situations).

In order to quantify the influence of different phytogeographical regions on the flora of the territory, an influence index (I) was calculated according to the following formula:

$$I = loo \cdot (a.b^{-1})^{-1}$$

where a = percent participation of the autochtonous species in the flora;

b = percent participation of the examined allochtonous species category in the flora.

Results and discussion

The percentage participation of different phytogeographical elements in the different compartments of the local flora (spontaneous, cultivated, or spontaneous and cultivated taken as a whole) is represented in table 2, the results regrading the analysis of the cultivated flora according to the given descriptors and descriptor states are included in table 3, the percentage distribution of the species belonging to different descriptor states is represented in figures nr.3-7.

Concerning the participation of species belonging to different geographical regions (descriptors ol and o2) in spontaneous and cultivated flora (fig.2) the most striking differences were recorded - according to the expectations - in the case of American species. Unconscious introductions, species naturalized in the spontaneous flora of the territory - the true American adventive species - have only a 1,59 % participation, as compared with 23,5 % participation of species of American origin in cultivated flora.

Tabl.2.

The percentage distribution of species of different floristic components in the spontaneous (A) and cultivated (B) flora of the sample territory

Floristic component	% A	% B
ol Eurasian	45,63	15,85
Circumpolar	9,27	
European s.l.	lo,5o	11,84
- Central-European	9,53	o,oo
- Continental-Pontian	3,53	1,21
- Mediterranean-Balkanic	9,89	13,o7
- Carpathian	1,68	
- Endemic	2,o3	2,18
Asian s.l.	o,26	
- Siberian	o,oo	1,94
- Central and West Asian	o,26	6,58
- East-Asian	o,oo	lo,41
- South-Asian	o,oo	3,63
Europa and Asia (total)	92,58	66,11
o2 American	1,59	
- North-American	1,41	lo,9o
- Central-American	o,o9	7,51
- South-American	o,18	5,13
African	o,27	
- North-African	o,o9	o,73
- Central-African	o,o9	1,45
- South-African	o,o9	4,6o
Australian and Oceanian	o,oo	o,73
Cosmopolitan	2,lo	1,21
America+Africa+Australia and Oceania (total)	3,81	31,9
Uncertain and other situations (hybrids e.g.)		1,45

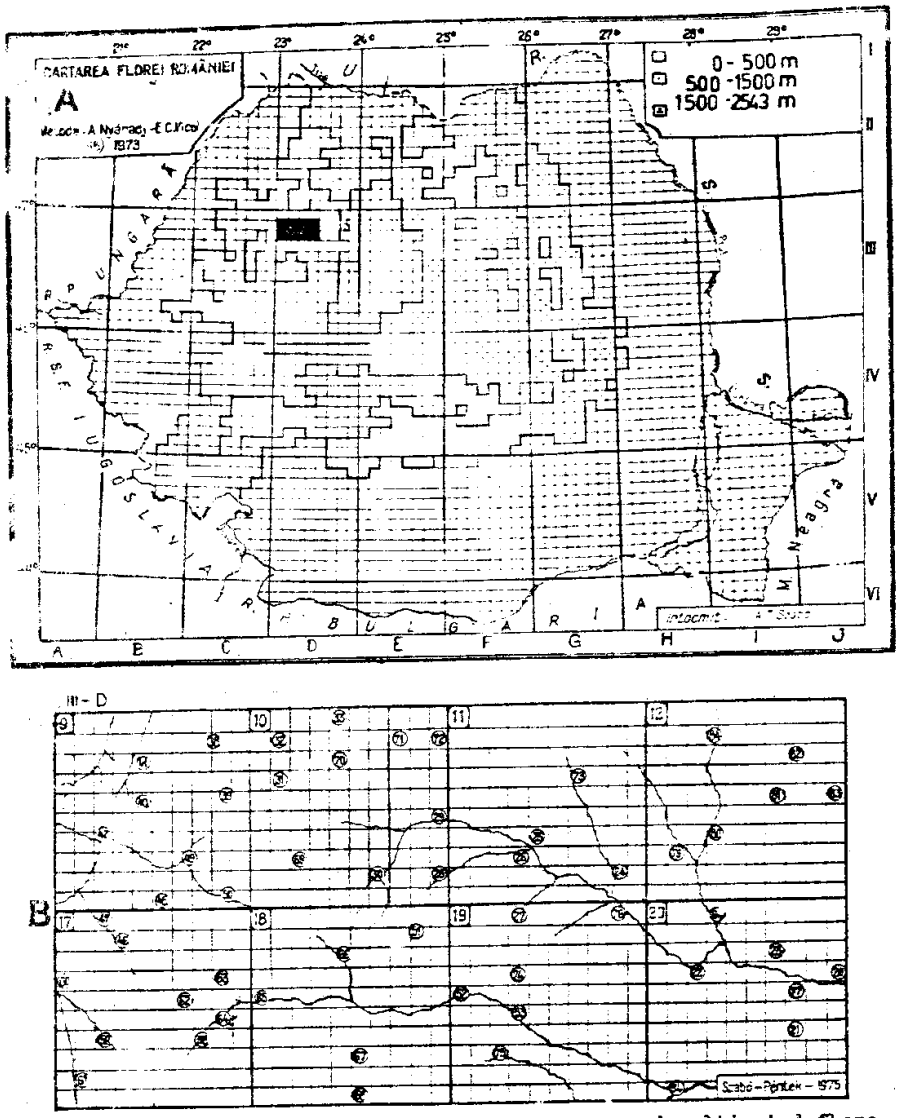

Fig. 1. Grid used for the sampling of the spontaeus and cultivated flora. A. Chorological grid for Romania; B. Grid for the sample territory with code numbers of unite scuares and localities. The position of the sample territory in Romania is idicated on map A (in black); for the position on the world map see Fig. 2. C.

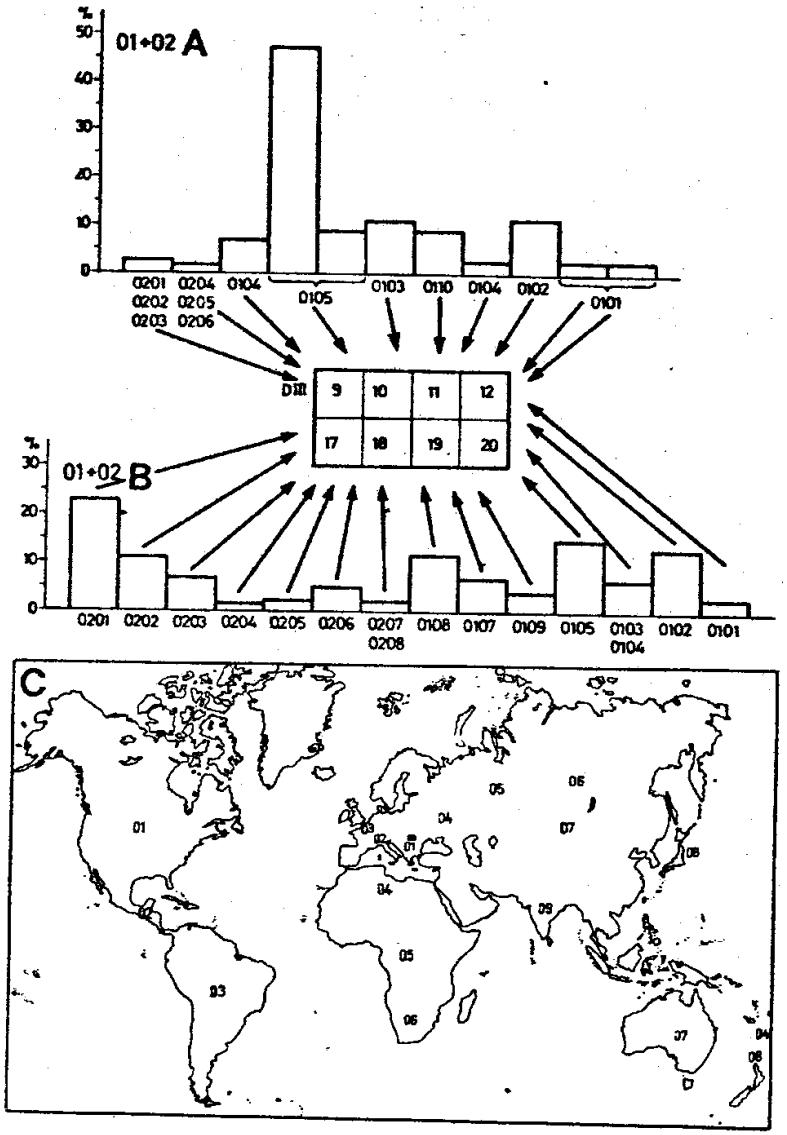

Fig.2. The percentage participation of species from different phytogeographical groups in the spontaneous (A) and cultivated (B) flora of the sample territory (descriptors and descriptor states according to table 1).

Tab.3.

Distribution of the species (absolute figures) belonging to different descriptor states in the cultivated flora registered on the North-Eastern border of the Apuseni-Mountains

Symbol	Descriptor states	o1	o2	o3	o4	o5	o6	o7	o8	o9	1o	x	xx	S
	Descriptors													
o1	Geographical origin ("Old World")	9	54	49	5	63	8	27	43	15	5	278	2	28o
o2	Geographical origin ("New World")	45	31	22	3	6	19	-	3	3	3	135	1	136
o3	Life form	1o4	23	135	1	39	5	64	29	1o	-	41o	6	416
o4	Main traditional use	11	9	24	8	25	32	265	15	5	21	415	1	416
o5	Main place of cultivation	58	23	2o5	26	26	17	16	8	2o	17	416	o	416
o6	Frequency of cultivation	128	94	72	24	55	-	-	3	-	34	41o	6	416
o7	Period of domestication (aprox.)	9	1o	45	82	73	-	5o	122	-	17	4o8	8	416
o8	Degree of domestication	226	2	28	-	51	-	55	-	44	1o	416	o	416
o9	Local variability	59	2	8o	-	56	-	3o	-	6	181	414	2	416
1o	Ethnobotanical knowledge	1o1	-	18o	-	79	-	17	-	7	17	4o1	15	416
11	Territorial dynamics	12o	145	41	1o	13	14	1	4	-	68	416	o	416
12	Territorial distribution	17	16	3o	39	18	1o	24	4	-	244	4o2	14	416

Descriptor states as in table I; x = number of species analyzed xx = number of species omitted from the given descriptor; S = total number of species.

In order to try a quantification of the influence of different floras on the floristic background considered autochtonous, we found that the calculated influence index (I) varies accordingly. E.g. the influence index of the American flora (taken as a whole) on the autohtonous European and Eurasian flora is much lower in the case of spontaneous flora (I_1 = 2,84) as compared with cultivated one (I_2 = 117 ,). The influence index values of different American subcontinents, on cultivated flora calculated accordingly, are the following:

North-American influence: $I_{2.N-Am}$ = 54,34

Central-American influence: $I_{2.C-Am}$ = 37,17

South-American influence: $I_{2.S-Am}$ = 26,67

Similarly, but to some extent more striking differences were recorded in the case of the African influence, which is very low for spontaneous flora ($I_{1.Af}$ = o,48), but is considerably higher ($I_{2.Af}$ = 38,76) for the cultivated flora.

As a general conclusion, it can be stated that the man-made flora is much more diversified phytogeographically, than the spontaneous one, and this fact has some general consequences in the planning of genetic conservation strategies.

The integration of the cultivated flora in different, partially or totally man-made ecological niches (place and mode of cultivation, descriptor o5) is represented in fig.3.

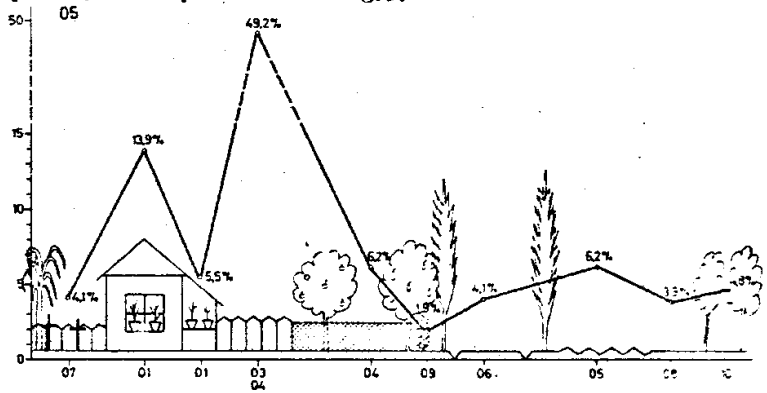

Fig.3. Percentage of different cultivated species in different environments of the examined territory

It is worth mentioning, that more than 7o % of the cultivated species noticed in the territory are very tightly bound to the man-made environments, to the living (or in churchyards even to the dead) men. The highest species percentage was registred in the closest vecinity of the house, in the legume and flower-garden (49,2 %), inside the house (13,9 %) and on porches (5,5 %). Some species have been associated mostly with dead persons, and preserved in cultivation especially, or even exclusively in cemeteries or churchyards (4,1 %). More distantly from the house generallylower values were registered: in fruit gardens 6,2 %, hedges 1,9 %, roadsides 4,1 %, crop fields 6,2 %, lawns and pastures 3,9 %, forests or other situations 4,8 %.

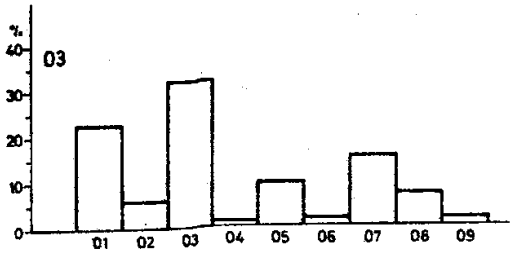

Fig.4. Percentage participation of the cultivated species belonging to different life forms (descriptor o3, table 1).

Regarding the local phenotypical variability (descriptor o9), our knowledge was inclomplete for a reliable characterisation of the situation in almost 5o % of the cases. In about 8,9 % of the cases a high or very high variability was noticed, in about 19,2 % of the cases the variability was found medium size, and in 14,2 was low (fig.5 A). The traditional ethnobotanical knowledge (descriptor 1o) seems to be tightly correlated with local phenotypical variability: in about 5,8 % of the cases a very thorough knowledge was registered, in 19,o % this knowledge was medium size and in 67,4 % very superficial or insignificant(fig.5 B).

By grouping the cultivated species according to their main traditional use (descriptor o4), the highest proportion of the cultivated flora belongs to the ornamentals (63,6 %). About 7,7 % are fodder plants or plants fit for raw materials in domestic industries, about 6,o % are fruitgrowing species, 8,8 % are legumes, 4,9 % are staple foods serving as carbohydrates, vegetal protein and fat sources, cultivated mostly in crop fields on large surface,4,5 % are used as tea, spices,addictives and medicinal plants etc. (fig.6 A).

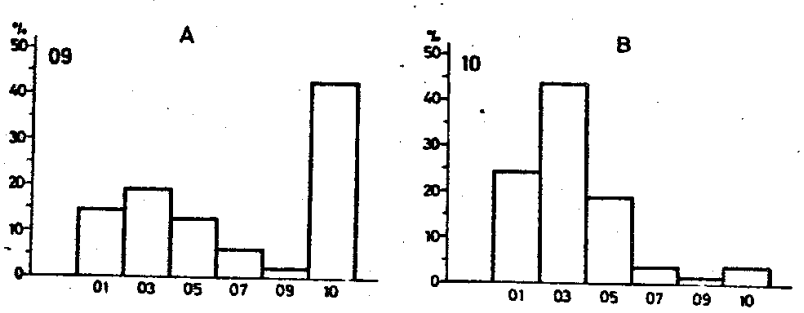

Fig.5. The observed local phenotypical variability (descriptor o9) and the traditional ethnobotanical knowledge (descriptor 1o) regarding the cultivated plants of the territory(for descriptor states see table 1).

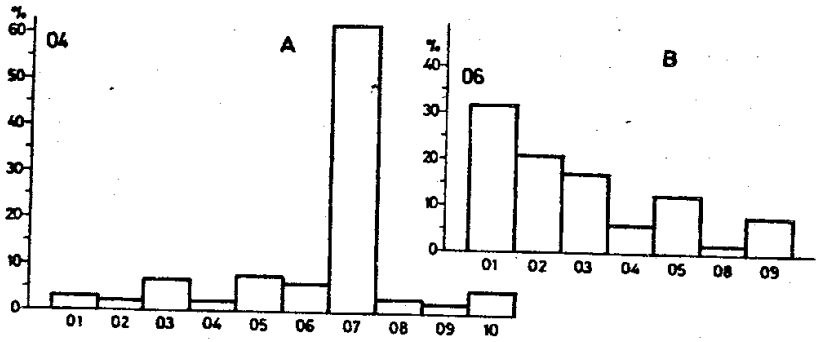

Fig.6A. Percent participation of different species categories according to main traditional use(descriptor o4).

Fig.6B. Percent participation of species according to territorial frequency of cultivation (descriptor o6).

In respect of the territorial frequency of cultivation (descriptor o6) only 13,2 % of the species registeredmay be considered as commonly cultivated, 21,1 % are frequent or very frequent and about the same percentage (22,6 %) is cultivated sparcely, or more often very sparcely, even rarely (3o,7 %). About 8,2 % of the traditionally cultivated species were to be found only from recollections of the old ones, and no more in cultivation (fig.6B).

Finally, an analysis was performed regarding the period and degree of domestication, and the dynamics of the cultivated flora in the territory. In respect of the period of domestication (descriptor o8)

about 2,2 % of the species registered are domesticated very long ago, 2,4 % were domesticated in ancient Europe, about 1o % were domesticated during the Middle Ages, 17.5 % and 12,o % were domesticated recently or very recently. In about one third of the cases registered (33,4 %) the period of domestication was found uncertain. It should be noted that, in this particular case, descriptor states were taken into consideration generally and not locally or territorially (fig. 7A).

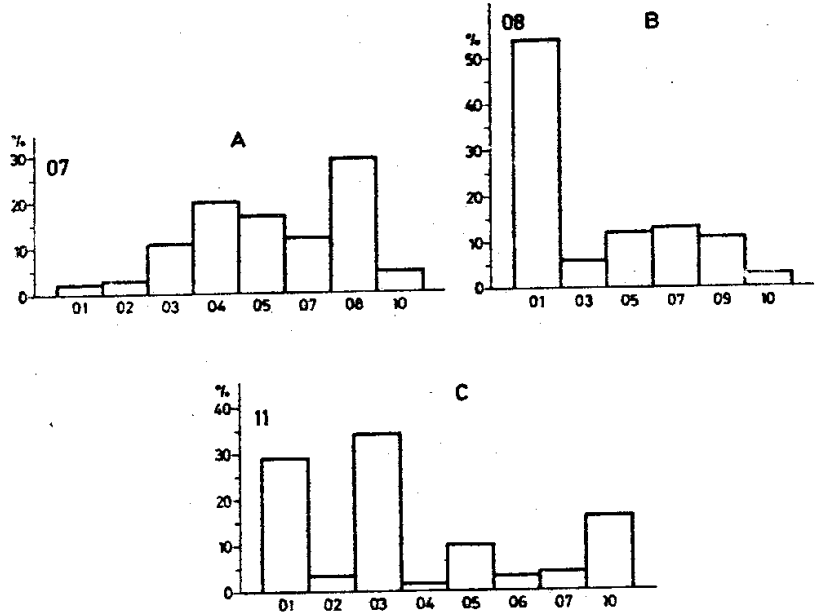

Fig.7. Percetage distribution of species in the cultivated flora according to : A. period of domestication (descriptor o8, table 1); B. degree of domestication (o7); C.territorial dynamics of domestication (11).

Concerning the degree of domestication, about 6o % of the species are fully (54,2 %) or almost (6,2 %) domesticated forming a category of plants absolutely dependent from man-made environments.About one quarter of the species are moderately or poorly domesticated (12,2 % and 1o,6 % respectively); these species, or their ssp. relative can be found in the spontaneous flora too (fig.7B).

Regarding the dynamics of species from the cultivated flora, only [illegible] of them form a constant and well established part of the

studied floristic compartment. A considerable number of species is just spreading (49 %) and some of them may be considered very recent introductions to the territory (2,4 %). About 1o % of the species are in the phase of steadily enriching the local variability mostly due to the introduction of new (local) varieties from more or less distant regions. All these cases have been recorded as different cases of a recently outlined phenomenon - genetic sedimentation (SZABÓ 1978, 1981). In contrast with genetic sedimentation, some of the species are in the phase of withdrawal and lowering the genetic variability (9,8 %, 3,1 %), or have already dissapeared from cultivation (3,4 %) due to genetic erosion phenomena operating in the territory (fig.7C).